opportunity to recover the costs that it incurred to discharge its past, present, and (if necessary) future regulatory obligations. If the Commission were to breach the regulatory contract in the name of achieving access charge "reform," then the incumbent LEC would be entitled to recover—under both contact principles and takings jurisprudence—its lost expectation of recovery of it economic costs.

250. The *Notice* proposes to base regulated prices for access on TSLRIC plus a "reasonable share of common costs," where that share is determined by arbitrary administrative mechanisms, such as fully distributed cost pricing or "reverse Ramsey" pricing. If the Commission were to adopt that proposal, it would cause access to be priced inefficiently. That result would impede the ability of incumbent LECs to compete for access, and it would create incentives for inefficient investment decisions and inefficient use of existing network capacity.

251. To avoid committing an uncompensated taking of property in violation of the Fifth Amendment, the Commission must ensure that, when it promulgates new regulations for the efficient pricing of interstate access, the agency simultaneously promulgates regulations that establish a competitively neutral and nonbypassable charge, to be imposed on end users or providers of interexchange services, which allows the incumbent LEC to recover all of its common costs, both forward-looking and historic, and not merely some subset of those costs that has been labelled "interstate" or "intrastate" as the result of an arbitrary convention of regulatory accounting. The obligation to provide the incumbent LEC the reasonable opportunity to achieve full recovery of such costs is the joint responsibility of the federal government and the respective states as they implement policies to reform access pricing.

* * *

I hereby swear, under penalty of perjury, that the foregoing is true and correct, to the best of my knowledge and belief.

J. Gregory Sidak

Subscribed and sworn to before me this 23rd day of January, 1997.

Notary Public

My Commission expires: July 31, 1999.

ATTACHMENT 4

Affidavit of
Dr. James H. Vander Weide

USTA Comments
CC Docket No. 96-262
January 29, 1997

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Access Charge Reform	)	**CC Docket 96-262**
Price Cap Performance Review for Local Exchange Carriers	)	**CC Docket 94-1**
Notice of Proposed Rulemaking, Third Report and Order and Notice of Inquiry	)	

AFFIDAVIT OF DR. JAMES H. VANDER WEIDE
IN SUPPORT OF COMMENTS OF
THE UNITED STATES TELEPHONE ASSOCIATION

I. Introduction

1. I am Research Professor of Finance and Economics at the Fuqua School of Business, Duke University. I have taught courses in corporate finance, investment management, management of financial institutions, statistics, economics, and operations research, as well as a Ph.D. seminar on the theory of public utility pricing. In addition to my teaching and executive education activities, I have written a book entitled, *Managing Corporate Liquidity: An Introduction to Working Capital Management*, and written numerous articles and research papers on such topics as portfolio management, the cost of capital, capital budgeting, the effect of regulation on the performance of public utilities, and cash management. I hold a Ph.D. in finance from Northwestern University and a B.A. from Cornell University. A brief review of my background is contained in Appendix 1 to this affidavit.

2. In response to the Commission's Fourth Further Notice of Proposed Rulemaking in CC Docket 94-1, AT&T, MCI, and the Ad Hoc Telecommunications Users Committee (collectively, the "Respondents") present proposals for measuring productivity that focus on accounting rates of return on investment rather than true economic productivity. On March 1,1996, I filed an affidavit in support of the reply comments of the United States Telephone Association (USTA). That affidavit demonstrates that: 1) the Respondents' productivity proposals are thinly-veiled attempts to reimpose rate of return regulation; 2) the Respondents' allegations that the LECs' accounting rates of return from 1991—1994 were excessive are neither true nor relevant; 3) the Respondents' failure to recognize the differences between economic and accounting rates of return causes them to reach incorrect conclusions concerning productivity, depreciation, and sharing; and 4) the Commission correctly moved away from rate of return regulation when it implemented its Price Cap Plan and should not reimpose rate of return regulation. The text and exhibits of that affidavit are included herein as Appendix 2.

3. My March 1996 affidavit also demonstrates that accounting rates of return are poor indicators of the return investors are actually receiving on their investment because accounting rates of return are based on: 1) accounting rather than economic depreciation, 2) book values rather than economic values, and 3) accrued revenues and expenses rather than cash flows. The true measure of what investors are getting on their investment is the economic rate of return. The Commission itself has recognized the importance of economic costs and economic rates of return in its three recent orders

on local competition, universal service, and access charges.[1]

4. My prior affidavit also shows that the LECs' economic rate of return for the period 1991-1994 is well below the Commission's 11.25 percent rate of return benchmark. My present affidavit provides results of an updated study of the LECs' economic rates of return for the period 1991-1995. This study indicates that the LECs' economic rate of return continues to be below the Commission's 11.25 percent rate of return benchmark.

II. The Commission should continue to regulate prices, not rate of return.

5. In 1990, the Commission instituted a price cap plan for the participating LECs that, unlike the predecessor rate of return regulation plan, is designed to regulate the LECs' access prices rather than their rates of return on investment. The Commission correctly recognized in establishing the price cap plan that rate of return regulation: 1) "discourages efficient investment;" 2) "encourages cost shifting;" 3) provides "little profit incentive to introduce new and innovative services;" and 4) "requires elaborate regulatory oversight of all the carriers' costs."[2] In contrast, pure price cap regulation provides incentives for the price cap LECs to reduce costs, invest in new telecommunications infrastructure, and introduce new products and services. Pure price cap regulation also reduces the administrative burdens of: determining revenues, expenses, and rate base; arbitrarily allocating revenues, expenses, and rate base to the

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[1] *In the Mater of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996,* First Report and Order, FCC 96-325 (released August 8, 1996); *In the Matter of Federal-State Joint Board on Universal Service,* CC Docket No. 96-45 (released November 8, 1996); *In the Matter of Access Charge Reform,* Notice of Proposed Rulemaking, Third Report and Order, and Notice of Inquiry, FCC 96-488, (released December 24, 1996).

[2] *Price Cap Performance Review for Local Exchange Carriers,* 9 FCC Rcd 1687 at §11 (1994).

interstate jurisdiction; and determining an appropriate depreciation allowance in a rapidly changing technological environment.

6. The Commission correctly moved away from rate of return regulation, with its disincentive effects and administrative burdens, when it instituted the price cap plan. Its reasons for doing so remain equally-if not more-sound today. The Commission should reject the Respondents' proposals to: 1) reinitialize price cap indices (PCIs) that would result in rates targeted to yield a rate of return of 11.25 percent; 2) prescribe a new rate of return as a basis upon which to reinitialize PCIs; or 3) adopt productivity proposals designed to reduce the LECs' access rates to the point that their regulatory accounting rates of return equal their prescribed economic cost of capital. Adopting such proposals would reintroduce the same skewed incentives and administrative burdens that the Commission sought to avoid when it adopted its Price Cap Plan. The Commission has correctly noted that "reinitializing indices based on earnings could have a negative effect on the productivity incentives of the LEC price cap plan. Represcribing a rate of return would be administratively burdensome."[3]

III. The LECs' economic rate of return during the period 1991-1995 is significantly less than the Commission's 11.25 percent benchmark rate of return.

7. The Commission should regulate the LECs' prices, not their rates of return. Nonetheless, if the Commission wishes to evaluate the economic performance of the price cap LECs under the price cap plan, it should review data regarding the LECs' ***economic rates of return*** on capital rather than their ***accounting rates of return*** on

[3] Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, *Notice of Proposed Rulemaking, Third Report and Order, and Notice of Inquiry,* at §230.

capital. Economic rates of return are the only rates of return that can be meaningfully compared to the LECs' economic cost of capital.

8. As shown on Schedule 1, I have calculated the LECs' economic rates of return on total capital using dividend data for the price cap LECs and Bureau of Economic Analysis data on the current value of various categories of telecommunications equipment. The price cap LECs' total company economic rate of return on investment is 8.75 percent for the period 1991-95.

9. The LECs' 8.75 percent economic rate of return is well below the Commission's 11.25 percent rate of return benchmark. The benchmark is based on cash flows and market values, not accrued income and book values. Thus, the benchmark is an **economic benchmark** that is only comparable to an economic rate of return. In contrast, accounting rates of return are based on accrued income and book values; and comparing accounting returns to an economic benchmark would be an "apples to oranges" comparison.

**Calculation of the Price Cap LECs'
Economic Return on Investment
1991-1995**

	Average 1991-1995
Average Cost of Debt	8.21
Average Debt Ratio	41.34
Economic Return on Equity	9.14
Average Equity Ratio	58.66
Price Cap LECs' Economic Return on Investment[1]	8.75%

Notes:

- The cost of debt is the average of each month's Moody's Aa-rated Public Utility Bond yield during the period.
- Average debt and equity ratios are calculated from the debt and equity data in the ARMIS 43-02 filings for the price cap LECs.

[1] The price cap LECs' economic rate of return on investment is the weighted average of its cost of debt and its economic rate of return on equity; for example, the economic rate of return on investment during the period 1991-1995 = (.4134*8.21) + (.5866 * 9.14) = 8.75 percent.

**Calculation of the Price Cap LECs'
Economic Rate of Return on Equity
1991—1995**

$$V_0 = \frac{C_1}{1+k} + \frac{C_2}{(1+k)^2} + \frac{C_3}{(1+k)^3} + \frac{C_4}{(1+k)^4} + \frac{C_5+V_1}{(1+k)^5}$$

Where ($ in thousands):

k	=	Economic Rate of Return on Equity
V_0	=	132,901,227
C_1	=	9,059,449
C_2	=	9,477,073
C_3	=	9,764,158
C_4	=	10,208,090
C_5	=	9,986,942
V_1	=	147,838,498

Economic Rate of Return on Equity = 9.14%

Notes:

- The current value of the embedded plant is calculated using Bureau of Economic Analysis investment price indexes. The source for this data is Attachment B, "Total Factor Productivity Review Plan," Schedule CAP1, Page 1 of 3, line 530 (updated for 1995). This attachment was filed with the Comments of the United States Telephone Association on Fourth Further Notice of Proposed Rulemaking.

- The value of V_0 was calculated by multiplying the current value of the price cap LECs' plant at the end of 1990 by the equity percent at the end of 1990.

- The value of V_1 was calculated by multiplying the current value of the price cap LECs' plant at the end of 1995 by the equity percent at the end of 1995.

- The values of C_1, C_2, C_3, C_4,and C_5 are the dividends paid by the price cap LECs in 1991, 1992, 1993, 1994, and 1995, respectively.

QUALIFICATIONS OF
DR. JAMES H. VANDER WEIDE

James H. Vander Weide is Research Professor of Finance and Economics at the Fuqua School of Business, Duke University. Dr. Vander Weide is also founder and President of Financial Strategy Associates, a consulting firm that provides strategic, financial, and economic consulting services, including cost of capital studies. He has testified on the cost of capital, risk, incentive regulation, pricing, depreciation, accounting, and other financial and economic issues before the U.S. Congress, the Federal Communications Commission, the National Telecommunications and Information Administration, the Federal Energy Regulatory Commission, the public service commissions of 33 states, and the insurance commissions of five states. He has also engaged in special research projects and designed financial software packages for firms in the banking, electric, gas, insurance, telephone, and water industries.

Educational Background and Prior Academic Experience

Dr. Vander Weide holds a Ph.D. in finance from Northwestern University and a B.A. from Cornell University. In January 1972, he joined the faculty of the School of Business at Duke University and was subsequently named Assistant Professor, Associate Professor, and then Professor. In 1982, he assumed the position of Associate Dean of Faculty Affairs at the Fuqua School. He resigned this position in July 1983 and is now Research Professor of Finance and Economics.

Since joining the faculty at Duke University, Dr. Vander Weide has taught courses in corporate finance, investment management, and management of financial institutions. He has also taught courses in statistics, economics, and operations research; a Ph.D. seminar on the theory of public utility pricing; and executive development seminars on the cost of capital, financial analysis, capital budgeting, mergers and acquisitions, cash management, short-run financial planning, and competitive strategy.

In addition to his teaching in the full-time educational programs of the Fuqua School of Business, he has been active in executive education at Duke. Dr. Vander Weide helped design the Duke Advanced Management Program at the Fuqua School of Business and served as Program Director for this program for five years. Dr. Vander Weide now serves as Program Director and/or teacher in many executive programs designed to prepare managers for the competitive environment in American industry, including the Duke Advanced Management Program, the Duke Executive Program in Telecommunications, Competitive Strategies in Telecommunications, and the Duke Program for Manager Development for managers from the former Soviet Union, the first in the United States designed exclusively for managers from Russia and the former Soviet republics.

Publications

Dr. Vander Weide has written a book entitled *Managing Corporate Liquidity: An Introduction to Working Capital Management* for John Wiley and Sons, Inc., which was published in August, 1984. He has also written a chapter on "Financial Management in the Short Run" for *The Handbook of Modern Finance*, and written research papers on such topics as portfolio management, capital budgeting, investments, the effect of regulation on the performance of public utilities, and cash management. His articles have been published in *American Economic Review, Financial Management, Journal of Finance, Journal of Financial and Quantitative Analysis, Journal of Bank Research, Journal of Portfolio Management, Journal of Accounting Research, Journal of Cash Management, Management Science, Atlantic Economic Journal, Journal of Economics and Business,* and *Computers and Operations Research.*

Professional Consulting Experience

Dr. Vander Weide has provided financial and economic consulting services to firms in the electric, gas, insurance, telecommunications, and water industries for over 20 years. He also testified on the cost of capital, risk, incentive regulation, pricing, depreciation, accounting, and other financial and economic issues before the U.S. Congress, the Federal Communications Commission, the Federal Energy Regulatory Commission, the National Telecommunications and Information Administration, the public service commissions of 33 states, and the insurance commissions of five states. He worked for Bell Canada on a special task force to study the effects of vertical integration in the Canadian telephone industry.

Other Professional Experience

Dr. Vander Weide has developed a cost of capital seminar that has attracted a national audience. In addition, he has conducted seminars and training sessions on financial analysis, competitive strategy, financial strategy, capital budgeting, cost of capital, cash management, depreciation policies, and short-run financial planning for a wide variety of U.S. and international companies, including Allstate, Ameritech, AT&T, Bell Atlantic, BellSouth, Carolina Power & Light, Contel, Fisons, Glaxo Wellcome, GTE, Lafarge, MidAmerican Energy, Norfolk Southern, Pacific Bell Telephone, The Rank Group, Southern New England Telephone, TRW, and Wolseley Plc.

In the 1970's, Dr. Vander Weide helped found University Analytics, Inc., one of the fastest growing small firms in the country. As an officer at University Analytics, he designedcash management models, databases, and software packages that are used by most major U.S. banks in consulting with their corporate clients. Having sold his interest in University Analytics, Dr. Vander Weide now concentrates on strategic and financial consulting, academic research, and executive education.

ATTACHMENT 5

"UPDATED RESULTS FOR THE SIMPLIFIED TFPRP MODEL AND RESPONSE TO PRODUCTIVITY QUESTIONS IN FCC'S ACCESS REFORM PROCEEDING"

Laurits R. Christensen, Philip E. Schoech and Mark E. Meitzen

USTA COMMENTS
CC Docket No. 96-262
January 29, 1997

Updated Results for the Simplified TFPRP Model and Response to Productivity Questions in FCC's Access Reform Proceeding

Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen
January 29, 1997

I. Introduction

In this paper, Christensen Associates presents updated results for the Simplified TFP Review Plan model (TFPRP) that produces Total Factor Productivity (TFP) estimates for the local exchange carriers (LECs) subject to price cap regulation. The FCC has tentatively concluded that a TFP approach should be adopted for developing the price cap X-Factor for the LECs.[1] We have previously demonstrated that the methods used in the Simplified TFP Review Plan model are based on proper economic principles and provide an economically meaningful measure of TFP growth.[2]

The model has been updated to include results for 1995. In addition, beginning with the 1995 over 1994 annual growth rates, the updated TFPRP incorporates new BEA chain-weighted price indexes.[3] For the most recent five-

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[1] Federal Communications Commission, First Report and Order, CC Docket 94-1, March 30, 1995, para 145.

[2] See Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Total Factor Productivity Methods for Local Exchange Carrier Price Cap Plans" December 18, 1995. Submitted as Attachment A to Comments of United States Telephone Association on Fourth Further Notice of Proposed Rulemaking, CC Docket 94-1, January 16, 1996. Hereafter referred to as "December, 1995 Report."

[3] This is accomplished by adopting the chain-weighted indexes for 1995 growth rates, leaving the previous 1988-1994 results as they were originally reported.

year period, 1990-1995, LEC TFP growth has averaged 3.1% annually. Considering that average annual U.S. TFP growth has been 0.4% over this period, the TFP differential that forms the basis of the X-Factor is 2.7% over the most recent five-year period.

We also respond to questions posed by the FCC in the December 24, 1996 Notice related to the estimation of TFP for the LEC price cap plan as the industry becomes more competitive.[4] In particular, the FCC inquires whether there is any justification for increasing the productivity offset, and if using a forward-looking cost of capital and economic depreciation has an impact on measured TFP growth. As we have previously demonstrated in the FCC's price cap proceeding, there is no basis for increasing the productivity offset as competition intensifies and, in fact, the evidence indicates that the X-Factor should be reduced. In the event that the FCC uses economic depreciation in establishing benchmark prices for other regulatory applications, we believe our depreciation rates will still be the most appropriate for a TFP study. While it may be an important consideration in other applications, using a forward-looking cost of capital (which is likely to be higher than the cost of capital under rate of return regulation) will have a negligible effect on TFP measurement.

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[4] Federal Communications Commission, Notice of Proposed Rulemaking, Third Report and Order, and Notice of Inquiry, CC Dockets 96-262, 94-1, 91-213, and 96-263, December 24, 1996. Hereafter referred to as the "Access Reform Proceeding."

II. Updated TFP Review Plan Results for 1995

Table 1 presents the annual growth rates for Total Output, Total Input, and TFP for the 1988-1995 period from the TFP Review Plan model. For the most recent five years of growth covering the period 1990-1995, average annual growth is 3.3% for Total Output, 0.2% for Total Input, and 3.1% for TFP.[5] Complete price cap LEC TFP results are presented in Attachment A.

Table 1
Local Exchange Carrier Total Factor Productivity Growth
1988-1995

	Total Output Growth	Total Input Growth	TFP Growth
1988			
1989	4.7%	2.9%	1.8%
1990	3.8%	0.0%	3.8%
1991	2.7%	0.7%	2.0%
1992	2.0%	-1.5%	3.5%
1993	4.0%	0.3%	3.7%
1994	3.8%	1.4%	2.4%
1995	4.1%	0.3%	3.8%
Average Growth			
1988-1995	3.6%	0.6%	3.0%
1990-1995	3.3%	0.2%	3.1%

[5] 1995 values were not available from BEA for current cost of U.S. net capital stock and constant cost of U.S. net capital stock that go into producing the U.S. economy cost of capital. 1995 values for these items were estimated by applying each series' respective average annual growth rate from the 1990-1994 period (found in TFPRP, page 2 of 3 schedule MISC1, lines 452 and 462).

Table 2 presents the latest five-year moving average growth rates, 1990-1995, for LEC TFP (from Table 1), U.S. economy TFP and the resulting TFP differential that forms the basis of the price cap X-Factor.[6] Over the 1990-1995 period, LEC TFP growth averages 3.1%, U.S. TFP growth averages 0.4%, and the resulting TPF differential is 2.7%.

Table 2
TFP Differential
1990-1995

	Five-Year Moving Average 1990-1995
LEC TFP Growth	3.1%
US TFP Growth	0.4%
TFP Differential	2.7%

III. Response to FCC's Productivity-Related Questions in Access Reform Proceeding

In the December 24, 1996 Notice of Proposed Rulemaking, Third Report and Order, and Notice of Inquiry, the FCC solicits comment on whether there is

[6] The 1995 value for the U.S. multifactor productivity measure of the private business sector is not available at this time. We have estimated the 1995 value by using the average annual growth rate in the series over the 1990-1994 period (found in TFPRP, page 1 of 3, schedule MISC1, line 261).

any justification for increasing the productivity offset.[7] According to the record we have previously established, there is no basis for increasing the productivity offset and, in fact, the evidence indicates that the offset should be reduced. The evidence we previously submitted in our December 1995 report shows that as prices are more closely aligned with marginal costs, total factor productivity (TFP) growth will decrease.[8] The evidence also shows that decreases in the rate of incumbent LEC (ILEC) output growth will also lead to decreases in ILEC TFP growth. Since ILEC market share will decline as we move to a competitive environment, one would expect the rate of ILEC output growth to decrease, as well as its rate of TFP growth.

The FCC also invites parties to discuss the effects of a forward-looking cost of capital and economic depreciation on TFP measurement. As we have previously established on the record, economic depreciation is the correct depreciation concept for purposes of measuring TFP, even when regulatory depreciation rates deviated from that concept. The fact that the FCC is considering a move toward economic depreciation for purposes of establishing cost benchmarks for certain regulatory applications has no implication for TFP measurement. This is because the depreciation rates used in our study are based on extensive academic research and are the most appropriate

[7] Access Reform Proceeding, paragraph 233.

[8] Specific cites from this report are noted below.

depreciation rates for measuring TFP. While the forward looking cost of capital may be higher than the ILEC's cost of capital under rate of return regulation (or previously under price caps) due to the increased volatility of its expected earnings and other sources of increased risk, this will have negligible impact on TFP measurement.

In the following sections, we elaborate on each of these points.

1. The restructuring of rates toward marginal costs will reduce the rate of TFP growth.

In our previous report, we established that using marginal cost weights, instead of current revenue weights, to measure output produces a considerably lower rate of measured TFP growth in the telephone industry.[9] This is due to the fact that telephone services with high price-marginal cost margins have had higher than average output growth. Access and toll services are the prime examples. To measure the growth in Total Output, one weights together the growth rates for the individual outputs. In the revenue weighted output index, the weights are based on revenue shares for the outputs. In the marginal cost weighted output index, the weights are based on cost elasticity shares. A service with a high price-marginal cost margin will have a higher revenue share

[9] December, 1995 Report, p. 8.

than a cost elasticity share. If that service also has an above average rate of output growth, using the revenue weight instead of the marginal cost weight will push the rate of measured Total Output growth upward.

The previous studies that we cited in our report, Crandall and Galst[10] and Fuss[11] show that this difference is substantial. The Crandall and Galst study of the U.S. telephone industry shows that the difference between the annual TFP growth rate based on a marginal cost weighting of output and the annual TFP growth rate based on revenue weighting is 1.7 percentage points per year. The Fuss study of Bell Canada showed a difference of 2.0 percentage points.

A corollary to this established fact is: if ILEC prices are realigned in the direction of marginal cost, the measured rate of TFP growth will decrease. The reason is that one of the sources of historical TFP growth, namely that high price-marginal cost margins for rapidly growing outputs, will be eliminated. Rapidly growing services will now have revenue weights much closer to cost elasticity weights, leading to a lower rate of Total Output growth and a lower rate of TFP growth. Thus, for any given rate structure, the effects of competition (or specific regulatory actions) that move existing rates closer to marginal costs will be to reduce TFP growth. Because we have no direct evidence on the expected

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[10] Robert W. Crandall and Jonathan Galst, "Productivity Growth in the U.S. Telecommunications Sector: The Impact of the AT&T Divestiture," The Brookings Institution, February 1991.

[11] Melvyn A. Fuss, "Telecommunications Growth in Canadian Telecommunications," Canadian Journal of Economics, May 1993.

magnitude of this specific effect as competition increases, we have not presented a specific prediction of the size of this reduction in measured TFP growth. Regardless of the lack of an estimate here, this effect will be real. Two other effects, however, can be quantified.

2. Impact of Rate Structure Changes on ILEC TFP Growth

The previous studies cited above lead to the conclusion that if ILEC prices are more closely aligned with marginal cost, measured TFP growth will decrease. In addition, restructuring that moves cost recovery from more rapidly growing rate elements to more slowly growing rate elements (or new rate elements with slower or no growth) will also reduce TFP growth. For example, the restructuring of the Carrier Common Line Charge (CCLC) and Transport Interconnection Charge (TIC) are currently under consideration. It is our understanding that the USTA proposes that the CCLC be recovered on a presubscribed line basis and TIC be recovered on a bulk-billed basis (currently, both are recovered on a per-minute basis). To determine how this change would affect measured TFP growth, we used the TFP Review Plan model to recompute TFP growth under the assumption that CCLC is recovered on a per-line basis and TIC is recovered as a per company assessment. Compared to the most recent five year period,

1990-1995, the TFP differential would decrease by 0.4 percentage points to 2.3% when these revenues are recovered under the proposed rate restructure.[12]

One must also recognize that restructuring will have a much larger impact on interstate revenue growth than it will on measured total factor productivity growth, due in part to the fact that interstate revenue represents approximately only twenty-three percent of total operating revenue for the price cap LECs. Currently, approximately 32 percent of interstate revenue is recovered through per-line charges and 55 percent is recovered through per-minute charges (of the remaining 13 percent, most comes from special access services). Under the restructuring proposed by USTA, approximately 48 percent of interstate revenue would be recovered through per line charges (or other rate elements with significantly slower growth than minutes), about 26 percent would be recovered through per-minute charges, and about 12 percent (currently recovered through the TIC) would presumably be recovered through bulk billing (i.e., a per company assessment).

Over the last five years, access lines have grown 3.0% per year while switched access minutes of use have grown 6.5% per year. Thus the growth in lines and minutes have contributed 4.5 percentage points to the growth in interstate revenue (.32 × 3.0 + .55 × 6.5). Under rate restructuring, the per line

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[12] Since the reweighting of output has no impact on the methods used to measure input prices, the reweighting has no impact on the input price differential.

and per minute growth would contribute only 3.1 percentage points to the growth in interstate revenue (.48 × 3.0 + .26 × 6.5). Thus, any X-Factor based on an analysis of interstate activity would need to incorporate a downward adjustment of 1.4 percentage points to recognize the fact that volume growth no longer generates the same revenue growth.

3. The decrease in market share that ILECs can expect under competition will lead to reductions in the rate of TFP growth.

In our original report in CC Docket 94-1, we established that there is a relationship between ILEC output growth and TFP growth, which is due to economies of density. [13] Economies of density describe the change in average cost when more output is provided over a network of fixed size. When average cost falls as output rises over a given network, economies of density are present. We established that the economic literature indicates that a one percentage point decrease in the annual rate of ILEC total output growth will lead to a 0.3 to 0.5 percentage point decrease in the rate of ILEC TFP growth.[14]

Under competition, the ILECs can expect to experience a decrease in total output growth, from what it otherwise would have been. This in turn will

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[13] Laurits R. Christensen, Philip E. Schoech, and Mark E. Meitzen, "Productivity of the Local Operating Telephone Companies Subject to Price Cap Regulation," Christensen Associates, May 3, 1994, pp. 19-23.

[14] Id., p. 23.

lead to a reduction in ILEC TFP growth. This effect will be present regardless of any movement of prices closer to marginal cost and any rate restructuring as described above.

Suppose, for example, for a given set of prices and rate structure, that the ILECs see a 10 percent decrease in their output growth over a five year period due to competitive losses, or an average 2 percent decrease per year. Using the 0.3 to 0.5 range established from the economic literature, annual TFP growth would decrease by between 0.6 to 1.0 percentage points over this period of time. Alternatively, if ILEC output growth would decrease by 20 percent over a five-year period due to competitive losses, or an average 4 percent decrease per year, annual TFP growth would decrease by between 1.2 to 2.0 percentage points. These ranges are found in Table 3 below. The first column of Table 3 presents the assumed annual output growth decrease, the second column presents the impact on TFP growth assuming a 1 percentage point decrease in output growth leads to a 0.3 percentage point decrease in TFP growth, and the third column presents the impact on TFP growth assuming a 1 percentage point decrease in output growth leads to a 0.5 percentage point decrease in TFP growth.

Table 3
Impact of Output Growth Reductions on ILEC TFP Growth

Output Growth Loss After Five Years	Annual Output Growth Decrease	Annual TFP Growth Decrease @ 0.3	Annual TFP Growth Decrease @ 0.5
-10%	-2%	-0.6%	-1.0%
-20%	-4%	-1.2%	-2.0%

4. The correct measure of TFP growth is based on economic depreciation, regardless of whether the ILEC is required to use regulatory depreciation in its accounting. Any FCC decision to use economic depreciation in establishing benchmark access prices would have no impact on the appropriate basis for measuring TFP.

In our December 1995 report, we established that the depreciation rates in our TFP study are based on extensive academic research, summarized by Hulten and Wykoff, and on the expected lifetimes used by the U.S. Bureau of Economic Analysis and U.S. Bureau of Labor Statistics for purposes of measuring capital in the U.S. economy.[15] We determined that these depreciation rates are the most appropriate ones for a TFP study. We furthermore established that it is inappropriate to use regulatory depreciation rates in a TFP study. In the event that the FCC uses economic depreciation in establishing benchmark prices for other regulatory applications, we believe our depreciation rates will still be the most appropriate for a TFP study.

[15] December, 1995 Report, pp. 12-14.